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(19) (CA) **CANADIAN PATENT** (12)

(54) PLASTIC TUBULAR OBJECTS AND METHOD
OF MANUFACTURING SAME

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Field of the Invention

The invention relates to the formation and strengthening of tubular objects such as pipes.

Description of the Prior Art

5 It is known to use plastic pipes for conveying water and other fluids and when buried,, particularly in large diameters, have by necessity, because of earth loading or pressure test requirements, needed to have wall thick-
10 nesses of substantial dimensions thus making such pipes expensive.

 Another problem with tubular objects is the bulk they present during transport and it has been proposed theretofore to form such tubular objects from strip and to wind the strip helically and to join the contiguous
15 edges to form the tubular object, such a system being described in the specification of United States Letters Patent No 3 938 558 which deals with a longitudinally corrugated metal strip which has edges which can be contiguously joined.

20 It is also known to form a flexible hose from strip which has shaped longitudinal edges so arranged that when the strip is helically wound the one edge engages in the configuration of the other edge to seal the hose and form a flexible member which has an upstanding helical
25 configuration on it but the strip is of relatively narrow width.

 A further known method is to use a strip of somewhat wider form, formed of a synthetic material which again has the longitudinal edges shaped so that the one edge can
30 engage into a socket in the other edge when the edges are

*

contiguously positioned, this being disclosed in the specification of United States Letters Patent No 3 606 670. The specification also discloses a machine for rolling the strip to helical form and pressure joining the edges.

The object of the present invention is to provide an improved form of strip and method of use which will have certain advantages over the known art and which avoids the need to have heavy sections and which can be used to form a tubular object such as a pipe or can be associated with a preformed pipe to stiffen and reinforce the pipe.

A further object of the invention is to provide a strip which can be wound onto a plastic pipe and can protect the pipe and if necessary can substantially reinforce the pipe.

A still further object is to provide a strip which can be wound into the form of a pipe and which has a configuration such that there will be adequate strength in such a pipe because of a helical configuration of reinforcements used on the strip.

A still further object is to provide a compound pipe consisting of an inner core and a surround which is locked to the pipe to provide a channel construction around the pipe to increase the strength and rigidity of the pipe which can also be used for secondary purposes such as secondary conveyor channels as part of the pipe.

A still further object is to provide a form of strip which can be used in such a way that it forms a series

of channels around the tubular object by using the strip in different ways and by, for instance, winding one strip on another as well as helically winding the two strips.

These and other objects will be appreciated from a description of the invention which follows.

Summary of the Invention

The method of forming a tubular article according to this invention comprises: providing an elongated strip of plastic material having a joining rib, an engaging rib and a series of longitudinally extending ribs spaced apart across the width of the strip on at least one side thereof with each of said ribs terminating in a free end portion and with each of at least some of said ribs having a flange adjacent its free end portion; helically winding said strip along a helical path without heating said strip to form the strip into a tubular configuration with the flanges forming reinforcements; and locking said joining rib to said engaging rib while helically winding the strip without heating and while the strip is in said tubular configuration to provide the tubular article.

The strip itself comprises a continuous strip formed by extrusion or similar means from a plastic material which has a series of ribs spaced along the width of the strip, and transversely spaced connecting means on the strip shaped to interengage the one with the other when such edges are placed contiguously by helically winding the strip on itself, the arrangement being such that a series of open channels are longitudinally located on the strip so that when wound into a helical configuration the tubular article has a series of spaced ribs which define channels so shaped that they may be closed by associating them with another surface where this is required.

Brief Description of the Drawings

Fig. 1 is an end elevation of a strip formed according to this invention.

FIG. 2 is a somewhat enlarged view showing how the two edges of contiguous parts of the strip interengage when wound together in a helical manner.

5 FIG. 3 is a perspective view of a tubular article manufactured from such a strip, the end of the article being shown partly unformed to clearly show the strip.

10 FIG. 4 is a view corresponding to FIG. 1 but showing how the strip can be reversed to provide a smooth outer surface and if required to be wound around an inner tube whereby to have a series of longitudinal channels on the strip which may be sealed to form secondary conduits.

FIG. 5 is a perspective view corresponding to FIG. 3 showing a pipe with such a helically wound strip thereon.

15 FIG. 6 shows how added members can be used to lock together the joins between two edges of such a strip.

FIG. 7 shows another form of edge using a reinforcing as well as a locking member.

FIG. 8 shows how the form of the invention shown in FIGS 1 to 3 can be filled in to further reinforce the strip.

20 FIG. 9 shows a modified form of strip in which the ribs are relatively closely spaced and the strip itself is apertured between the ribs to provide a device which can for instance be used as a sand screen when such a strip is arranged in helical configuration.

25 FIG. 10 shows a further embodiment of such a device.

FIG. 11 shows a modified form of strip which is arranged to form a series of closed channels longitudinally when a series of these strips are joined and formed into the helical orientated tubular object.

FIG. 12 is a somewhat enlarged fragmentary view showing how such a strip joins to form the closed channels.

5 FIG. 13 shows very schematically how a strip of the invention may be drawn off from a supporting reel and formed into a tubular article.

Description of the Preferred Embodiments

Referring first to FIGS. 1, 2 and 3, it will be seen that the strip 1 has on it a series of upstanding
10 ribs 2 which ribs are strengthened at their outer ends by small flanges 3, the rib 2a at the one edge of the strip, referred to as a joining rib, having a series of barbs 4 on it, the rib 2b near the other edge of the strip, referred to as an engaging rib, being shaped to
15 form a barbed socket 5 and arranged so that the rib 2a can engage the socket of the rib 2b, the strip having the rib 2b shaped so that it presses against an adjacent rib 2 when the two edges are joined as shown more particularly in FIG. 2 where it will be noted that the
20 edge of the rib 2c engaged beneath the flange 3 on the rib 2. This forms a series of channels 6.

In FIG. 3 is shown how a tubular object such as a pipe is formed when a strip is helically wound and the edges interengage by forcing the rib 2a into the socket
25 5 of the rib 2b.

In FIGS. 4 and 5 is again shown a strip similar to that shown in FIG. 1 but in this case the strip 11 has the rib 12 inwardly positioned when the tubular object

is formed by helically winding such a strip, the strip again having a barbed joining rib 12a at one end and a socket 15 in the engaging rib 12b but in FIG. 4 this strip is shown wound onto a liner 17 which may be a
5 pipe which is required to be reinforced, and when such a strip is tightly wound onto the liner 17 with the barbed rib 12a engaged in the socket 15 of the rib 12b a series of channels 16 result which can be sealed if required by cementing or otherwise joining the flanges 13 to the
10 liner 17. It will be obvious however that the strip of FIG. 1 can similarly be used in this inverted manner without winding it onto a liner, and whether the configuration of FIG. 3 or FIG. 5 is used depends on whether a smooth outside surface is required or whether the ribs
15 are merely for the purpose of stiffening and protecting and particularly whether the secondary channels are required.

In FIG. 6 is shown how a strip 21 can be helically wound with the ribs 22 again being upstanding from the
20 body of the strip itself but the joint between the joining rib 22a and the engaging rib 22b which forms the socket is reinforced by placing over it an extrusion 28 which fits over the join between the two edges of the strip and further locks the assembly together, the extrusion
25 preferably being made of rigid polyvinyl-chloride so that not only does it lock the joint but it also provides adequate reinforcing along the marginal edges of the strip.

In FIG. 7 a similar configuration is shown with the strip 31 again having ribs 32 upstanding from it and
30 including a barbed forming rib 32a as well as an engaging rib 32b with socket into which it fits but the edge of the strip in this case is held down by a foam packing 38 which helps to secure the lock, and also a wire 39 is

shown which has the effect of providing reinforcing at the join.

5 In FIG. 8 a similar configuration is again used in that the strip 41 has upstanding ribs 42 but in this case the longitudinal channels 46 between the ribs are filled by a material such as concrete to form a helical filler 49. The concrete can be poured into the channels 46 and in that case the strip 41 forms a liner for the filler 49.

10 In FIG. 9 the strip 51 again has ribs 52 but these are spaced closer together than in the previous embodiment and have shaped flanges 53 at the outer ends which form narrow openings between them, and the strip 51 itself is apertured at 58 between the ribs 51 and the device can
15 then be used as a bore screen or the like where water is to permeate into the hollow of the screen but sand is prevented from entering the defined space.

FIG. 10 shows a similar configuration to FIG. 9 but in this case the strip 61 has larger ribs 62 at spaced
20 intervals with smaller ribs 62d between the larger ribs 62 and here also the outside edges of the ribs 62 and 62d are provided with flanges 63 which can then form between them narrow slots so far as the smaller ribs 62d are concerned but the extending ribs 62 serve to prevent large
25 materials from reaching and blocking the gaps between the ribs 62d, holes or slots 68 again being used through the strip to allow flow of liquid so that the device again acts as a bore screen or the like.

30 In the form shown in FIGS 11 and 12 the strip 71 is shaped in such a manner that closed channels 76 are provided between the upstanding ribs 72, the strip 71 in this case extending from an outer joining rib 72a, which

is provided on its outer face with barbs 74, to an intermediate rib 72e, which forms the engaging rib, which again has barbs 74, but on both faces, and the opposite end of the continued strip has a further, but downformed, rib 72f on it with again barbs 74 at the outer face. One part of the strip has ribs 72 extending in the same direction as the rib 72a, but the other part of the strip has sockets 78 spaced similarly to the ribs 72 but down formed so that no one part of such strip is placed on the other part of the strip, the ribs 72 of the one can engage the sockets 78 of the other as shown more particularly in FIG. 12. It is to be noted that the two ribs 72a and 72f face in the opposite direction, and by displacing one strip half the width of the other strip during the helical winding a doubled walled structure results, the rib 72a of one part of the strip engaging the rib 72e of the other part of the strip.

The wound strip as generally described in this specification can have a further strip wound over it, preferably in the opposite direction for further reinforcement, or it can be sprayed or can otherwise have applied to it when formed into a tubular object a bonding material to lock the sections of the strip firmly together.

FIG. 13 shows the strip 91 being fed from a reel 94, which contains a coil of strip 95, to between a pair of forming rollers 90 which force the joining rib into the socket of the engaging rib when the rollers 96 are driven to feed the strip 91 from the coil 95 on to itself at this point to form the tubular article 97, the article 97 resting on roller supports 98 which allow the article 97 to rotate as the further length of strip 91 from the coil 95 is joined on to it.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A method of forming a tubular article comprising:
providing an elongated strip of plastic material having a joining rib; an engaging rib and a series of longitudinally extending ribs spaced apart across the width of the strip on at least one side thereof with each of said ribs terminating in a free end portion and with each of at least some of said ribs having a flange adjacent its free end portion;
helically winding said strip along a helical path without heating said strip to form the strip into a tubular configuration with the flanges forming reinforcements; and
locking said joining rib to said engaging rib while helically winding the strip without heating and while the strip is in said tubular configuration to provide the tubular article.
2. The method of claim 1 wherein the said connecting means are formed by a joining rib at one longitudinal edge of the said strip and a complementary engaging rib spaced from the first said rib at a distance to achieve the required overlap, and connecting the said ribs together while winding the strip to helical form.
3. The method of claim 2 wherein the joining rib is a barbed rib and the complementary engaging rib has a barbed socket formed therein from the opposite side of the said strip, and engaging the said barbed joining rib in the said socket of the engaging rib as the strip is wound.
4. The method of claim 3 wherein the said strip extends outward past the said socket rib and is shaped to engage an adjacent rib, and engaging the said extension on a said rib.
5. The method of claim 2 wherein the strip extends laterally past the said complementary engaging rib but displaced in plane and has a series of longitudinal down-formed sockets on such extension, and engaging the edges of the said upstanding ribs in the said sockets on the laterally extending strip.

6. The method of claim 1 or 2 wherein the said tubular article is formed by so winding the strip that the said ribs project outwardly on the tubular article.

7. The method of claim 1 or 2 wherein the said tubular article is formed by so winding the strip that the said ribs project inwardly on the said tubular article.

8. The method of claim 1 wherein the channels between the said ribs are filled with a solid material during or after helically winding the said strip.

9. The method of claim 1 or 6 or 7 wherein the said strip is wound on to a tubular article to reinforce said article.

10. The method of claim 2 wherein the said joining and engaging ribs are further connected by cementing the said ribs together during winding.

11. The method of claim 2 wherein the said joining and engaging ribs are further connected by winding a reinforcing strip over the said joining ribs.

12. The method of claim 3 wherein a reinforcing wire is positioned in the said barbed socket prior or during winding of the said strip into helical form.

13. The method of claim 1 wherein the said strip is wound into helical configuration and interengaged at

spaced intervals to form a hollow articles, and wherein
a further strip is wound over the said strip with the
5 helix being formed in the opposite direction whereby to
reinforce the said strip.

14. The method of claim 1 wherein the said strip
when wound into helical configuration has a bonding
material applied to it.

15. The method of claim 1 wherein the said ribs
are in the form of corrugations disposed between a
joining rib and an engaging rib, helically winding the
said strip on to a pipe, and engaging the joining rib
5 in the engaging rib.

16. An elongated strip for forming articles by
helically winding the said strip to overlap at least its
two longitudinal edge portions characterized by a series
of ribs spaced apart across the width of the strip on at
least one side thereof to form therebetween a series of
10 open longitudinally-extending side-by-side channels, each
of at least some of said ribs having a flange adjacent
its free-end portion to strengthen such ribs, and connect-
ing means on said strip spaced apart transversely on the
15 said strip and adapted to interengage and be connected to-
gether when one edge portion of the strip is placed over
at least the other edge portion of the strip when helical-
ly winding the said strip, whereby to hold the said strip
in its helical configuration when wound.

17. An elongated strip according to claim 16
wherein the said connecting means includes a joining rib
adjacent one longitudinal edge of the said strip and a
complementary engaging rib spaced from said joining rib

- 5 at a distance to give the selected overlap when such a strip is helically wound by engaging the joining rib with the engaging rib.

18. An elongated strip according to claim 17 wherein the said joining rib is a barbed rib on one side of the strip and the said engaging rib is on the same side of the strip and has a barbed socket formed therein from the opposite side of the said strip.

19. An elongated strip according to claim 18 wherein the said strip has an extension outwards laterally from the said engaging rib to engage an adjacent rib when the said strip is helically wound.

20. An elongated strip according to claim 17 wherein the said strip has an extension laterally past the said engaging rib but displaced in plane approximately at the free end portions of the ribs of the said strip and has a series of longitudinal sockets formed on such extension spaced and located to engage the free end portions of the said upstanding ribs when such a strip is wound helically.

21. An elongated strip according to claim 17 wherein the said ribs other than the said joining rib are "T" shaped whereby to restrict the outer part of the said channels formed between the said ribs.

22. An elongated strip according to claim 16 wherein the said ribs are relatively closely spaced and said flanges are expanded adjacent their free end portions to form slits opening from the said channels formed between the ribs.

23. An elongated strip according to claim 22 characterised by apertures through the said strip opening to the said channels.

24. An elongated strip according to claim 22 or 23 characterised by some of said ribs projecting further than other of the ribs.

25. An elongated strip according to claim 16 wherein the connecting means includes a rib adjacent one longitudinal edge of the strip forming a barbed joining rib and a rib adjacent the other longitudinal edge of the strip forming an engaging rib for the said joining rib, said engaging rib having a longitudinal socket opening from the opposite side of the said strip.

26. An elongated strip according to claim 16 wherein the said strip has adjacent one longitudinal edge an upstanding barbed rib and at the other longitudinal edge a down-formed barbed rib and at an intermediate part an intermediate barbed rib, said intermediate rib joining a first part of the strip to a second part of the strip with the two parts displaced in plane by the said intermediate rib, a series of said ribs being on the said first part, and a series of down-formed sockets on the second part of the strip positioned to engage the flanges of said series of ribs when the said strip is helically wound to position the said sockets over the said ribs.

27. A tubular article formed by helically winding an elongated strip to overlap at least its two longitudinal edge portions, said strip being characterised

5 by a series of ribs spaced apart across the width of
the strip on at least one side thereof to form there-
between a series of open longitudinally-extending side-
by-side channels, each of at least some of said ribs
having a flange adjacent its free-end portion to streng-
then such ribs, and connecting means on the said strip
10 spaced apart transversely on the said strip and adapted
to interengage and be connected together when one edge
portion of the strip is placed over at least the other
edge portion of the strip when helically winding the
said strip whereby to hold the said strip in its helical
15 configuration when wound.

28. A tubular article according to claim 27
wherein the said connecting means comprise interengaging
ribs spaced apart transversely on the said strip.

29. A tubular article according to claim 27 or 28
wherein the surface of the said tubular article has seal-
ing means applied thereto to strengthen the said article.

30. A tubular article according to claim 29
wherein the said strip is helically wound on to a pipe
to form a series of closed channels around the said pipe.

31. An elongated strip as defined in Claim 16
wherein said connecting means includes a first connecting
member adjacent one longitudinal edge of said strip and
a co-operating connecting member adjacent the other lon-
5 gitudinal edge of said strip, said connecting members
being adapted to interlock when the strip is helically
wound, said strip having a lateral extension from said co-
operating connector member and means co-operating with
said extension for interlocking with the flange of the

10 rib adjacent to said extension when the strip is helically wound.

32. An elongated strip as defined in claim 31 wherein said extension includes a first leg extending laterally and a second leg projecting from the strip in the same general direction as said adjacent rib, said co-
5 operating means includes said second leg and said second leg interlocks with said flange of said adjacent rib when the strip is helically wound.

33. An elongated strip as defined in claim 31 wherein said co-operating means includes a packing member acting between said extension and the flange of said adjacent rib.

34. An elongated strip as defined in claim 31 wherein said connecting members interengage to form a joint when the strip is helically wound and said co-
5 operating means includes a member for receiving said joint and overlying said extension.

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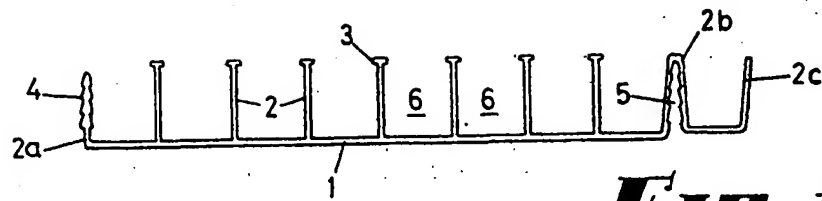
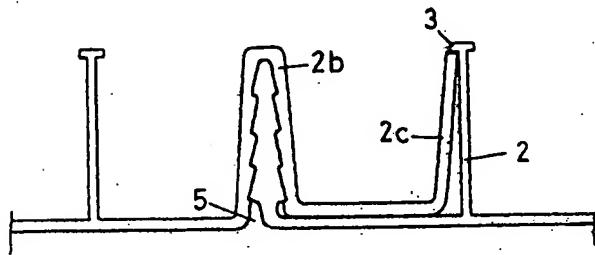
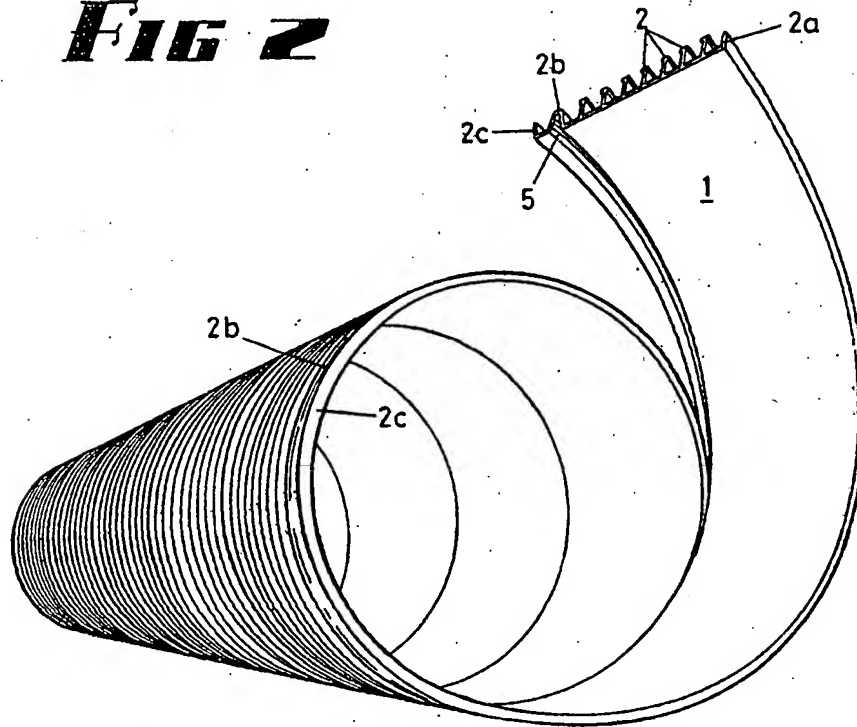
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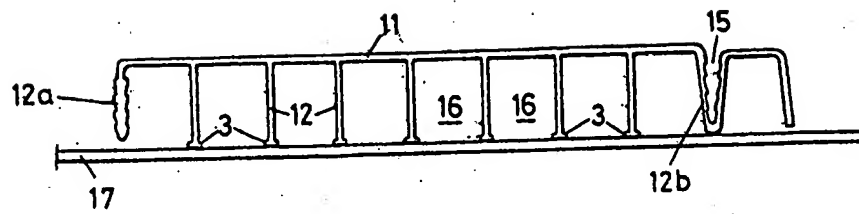
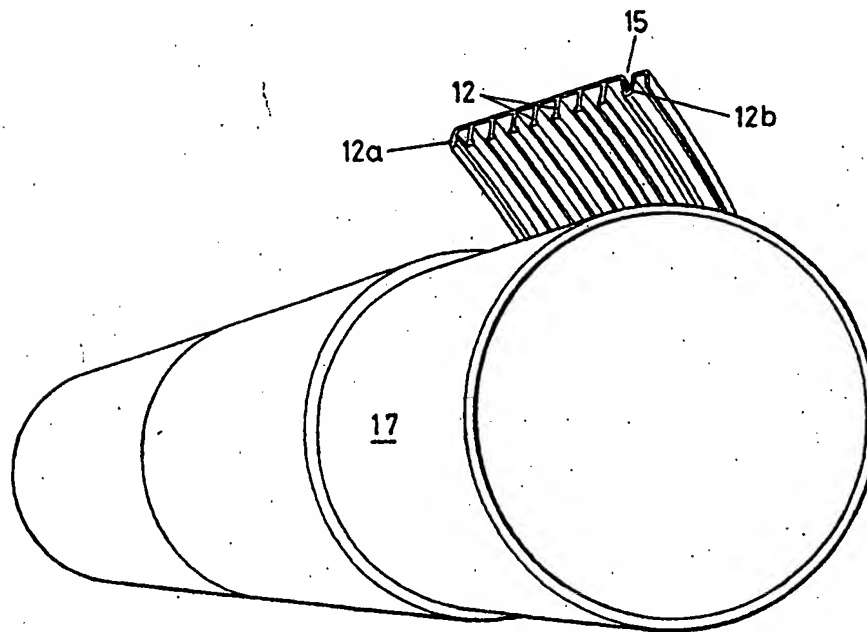
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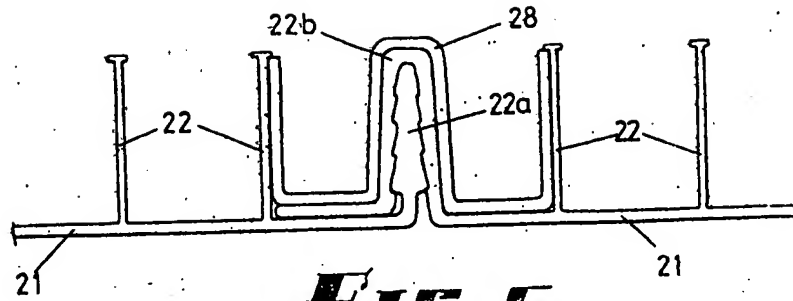
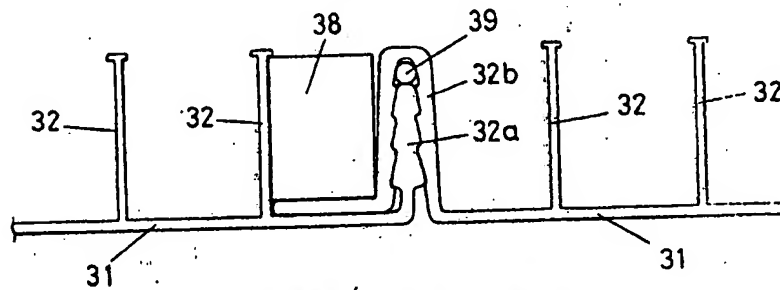
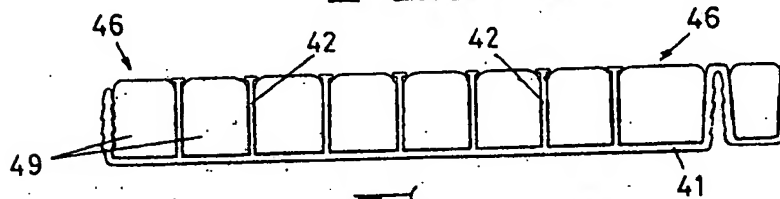
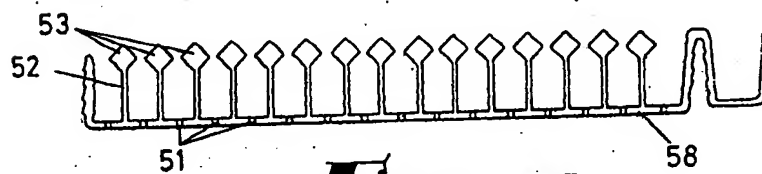
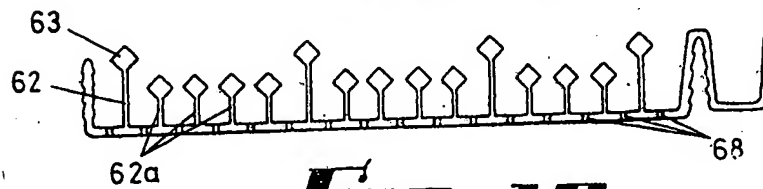
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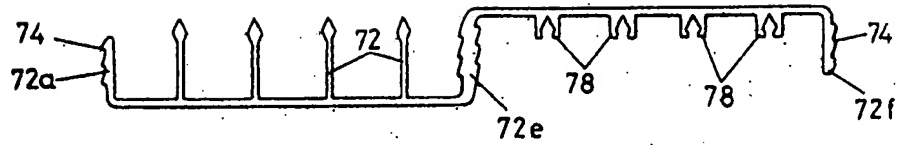
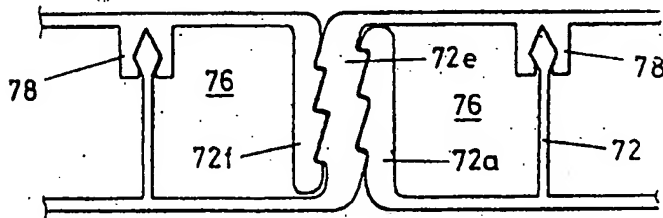
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The formation of articles using an elongated strip which has on it a series of longitudinally positioned upstanding ribs to form between them a series of longitudinally positioned channels and including connecting means on the strip spaced apart transversely on the strip whereby the strip can be wound helically to form an elongated object with the connecting means interengaged along a helical line to lock the strip in object form.

**FIG 1****FIG 2****FIG 3**

**FIG 4****FIG 5**

**FIG 6****FIG 7****FIG 8****FIG 9****FIG 10**

**FIG 11****FIG 12**

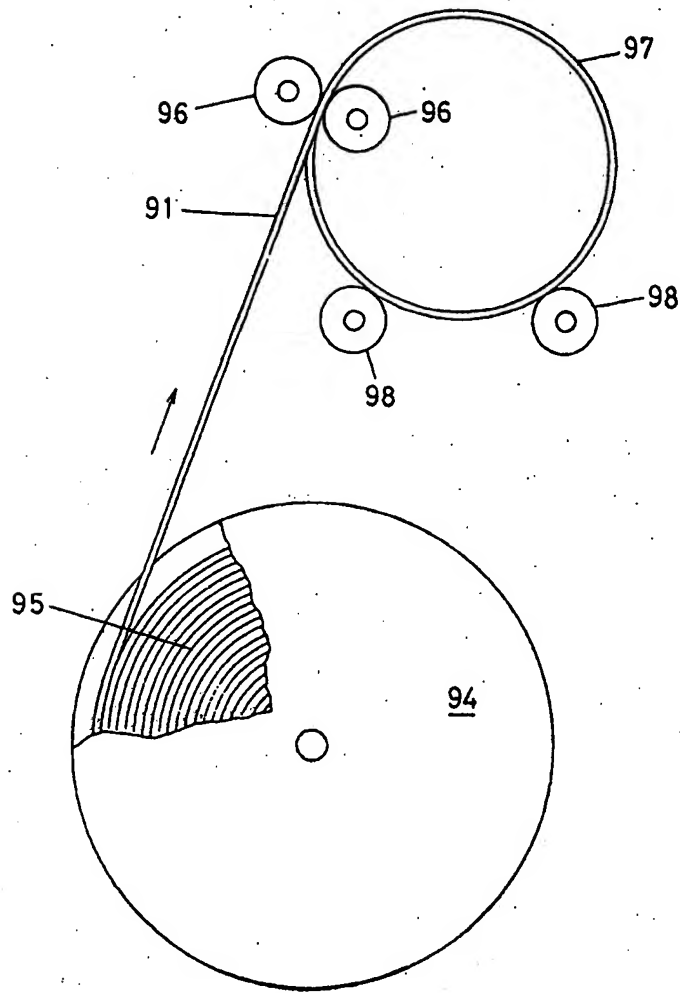


FIG 13